**WHAT IS CLAIMED IS:**

1. A method of estimating a position of a mobile terminal operating in a coverage area of a radio telecommunications network having a plurality of base station transceivers and a plurality of service area sectors, said method comprising the steps of:

determining, for a plurality of positions throughout the coverage area of the network, expected Received Signal Strength (RSS) values of a signal transmitted by the base station transceivers and received by a typical mobile terminal;

storing the expected RSS values at a plurality of locations in a database;

obtaining, by the mobile terminal for which the position is to be estimated, RSS measurements of signals transmitted by the base station transceivers;

comparing the RSS measurements obtained from the mobile terminal with the expected RSS values stored in the database; and

estimating the position of the mobile terminal based on differences between the RSS measurements and the expected RSS values.

2. The method of estimating a position of a mobile terminal of claim 1 wherein the step of determining expected RSS values for a plurality of positions throughout the coverage area of the network includes predicting the expected RSS values with a computer-aided prediction tool.

3. The method of estimating a position of a mobile terminal of claim 2 wherein the step of predicting the expected RSS values with a computer-aided prediction tool includes predicting the expected RSS values with a computer-aided prediction model that considers the effect of terrain and clutter on the expected RSS values.

4. The method of estimating a position of a mobile terminal of claim 1 wherein the step of determining expected RSS values for a plurality of positions throughout the coverage area of the network includes taking a plurality of actual measurements of the RSS of signals transmitted by the base station transceivers and received by a test mobile terminal.

5. The method of estimating a position of a mobile terminal of claim 1 wherein the step of determining expected RSS values for a plurality of positions throughout the coverage area of the network includes

taking a plurality of actual measurements of the RSS of a signal transmitted by a test mobile terminal and received by the base station transceivers.

6. The method of estimating a position of a mobile terminal of claim 1 wherein the step of determining expected RSS values for a plurality of positions throughout the coverage area of the network includes the steps of:

predicting the expected RSS values for a first portion of the positions with a computer-aided prediction tool; and

taking actual measurements of the RSS of signals transmitted by the base station transceivers and received by a test mobile terminal for a second portion of the positions.

7. The method of estimating a position of a mobile terminal of claim 6 wherein the step of storing the expected RSS values in a database includes storing an indicator for each value indicating whether each stored value is a predicted value or a measured value.

8. The method of estimating a position of a mobile terminal of claim 7 wherein the step of comparing the RSS measurements obtained from the mobile terminal with the expected RSS values stored in the database includes the steps of:

associating a covariance matrix with each of the locations in the database;

extracting a sub-matrix of the covariance matrix whose columns and rows correspond to sectors that are common between the sectors stored for the locations in the database and the sectors for which the RSS measurements were obtained from the mobile terminal;

calculating, for each location in the database, a probability that RSS measurements are obtained, given that the mobile terminal is at that location; and

computing metrics for each location in the database utilizing the calculated probability and a second probability that the mobile terminal is located at the corresponding position.

9. The method of estimating a position of a mobile terminal of claim 7 wherein the step of comparing the RSS measurements obtained from the mobile terminal with the expected RSS values stored in the database includes the steps of:

associating a first covariance matrix with each of the locations in the database that are populated with measured values, said first matrix containing rows corresponding to all sectors for which measurements are stored in the database for that location;

associating a second covariance matrix with each of the locations in the database that are populated with predicted values, said second matrix containing rows corresponding to all sectors for which measurements are stored in the database for that location;

determining from the stored indicator, whether the location in the database was populated with a measured value or a predicted value;

selecting the first covariance matrix if the location was populated with a measured value;

selecting the second covariance matrix if the location was populated with a predicted value;

extracting a sub-matrix of the selected covariance matrix whose columns and rows correspond to sectors that are common between the sectors stored for a location in the database and the sectors from which the RSS measurements were obtained from the mobile terminal;

calculating, for each location in the database, a probability that RSS measurements are obtained, given that the mobile terminal is at that location; and

computing metrics for each location in the database utilizing the calculated probability and a second probability that the mobile terminal is located at the corresponding position.

10. The method of estimating a position of a mobile terminal of claim 7 wherein the step of storing the expected RSS values at a plurality of locations in the database includes storing, for each location in the database, an expected measurement variance for each service sector; and the step of comparing the RSS measurements obtained from the mobile terminal with the expected RSS values stored in the database includes the steps of:

weighting the RSS measurements obtained from the mobile terminal with the expected measurement variance for the mobile terminal's service sector; and

comparing the weighted RSS measurements with the expected RSS values stored in the database.

11. The method of estimating a position of a mobile terminal of claim 7 wherein the step of storing the expected RSS values at a plurality of locations in the database includes the steps of:

storing in the database for each service sector, a first expected measurement variance for all locations in the database that are populated with measured values; and

storing in the database for each service sector, a second expected measurement variance for all locations in the database that are populated with predicted values.

12. The method of estimating a position of a mobile terminal of claim 11 wherein the step of comparing the RSS measurements obtained from the mobile terminal with the expected RSS values stored in the database includes the steps of:

weighting the RSS measurements obtained from the mobile terminal with the first expected measurement variance if the locations in the database being used for the comparing step are populated with measured values;

weighting the RSS measurements obtained from the mobile terminal with the second expected measurement variance if the locations in the database being used for the comparing step are populated with predicted values; and

comparing the weighted RSS measurements with the expected RSS values stored in the database.

13. The method of estimating a position of a mobile terminal of claim 7 wherein the step of storing the expected RSS values at a plurality of locations in the database includes the steps of:

storing, for the entire database, a first expected measurement variance for all locations in the database that are populated with measured values; and

storing, for the entire database, a second expected measurement variance for all locations in the database that are populated with predicted values.

14. The method of estimating a position of a mobile terminal of claim 13 wherein the step of comparing the RSS measurements obtained from the mobile terminal with the expected RSS values stored in the database includes the steps of:

weighting the RSS measurements obtained from the mobile terminal with the first expected measurement variance for locations in the database that are populated with measured values;

weighting the RSS measurements obtained from the mobile terminal with the second expected measurement variance for locations in the database that are populated with predicted values; and

comparing the weighted RSS measurements with the expected RSS values stored in the database.

15. The method of estimating a position of a mobile terminal of claim 7 wherein the step of estimating the position of the mobile terminal based on differences between the RSS measurements and the expected RSS values includes the steps of:

determining whether the percentage of locations in the database being considered as candidates for the location of the mobile terminal that are populated with actual measurements exceeds a predefined threshold; and

upon determining that the percentage of locations populated with actual measurements exceeds the predefined threshold:

discarding the RSS values that are predicted values; and

utilizing an estimator based on a maximum-likelihood criterion to estimate the position.

16. The method of estimating a position of a mobile terminal of claim 7 wherein the step of estimating the position of the mobile terminal based on differences between the RSS measurements and the expected RSS values includes the steps of:

determining whether the percentage of locations in the database being considered as candidates for the

location of the mobile terminal that are populated with actual measurements exceeds a predefined threshold;

utilizing an estimator based on a maximum-likelihood criterion to estimate the position, upon determining that the percentage of locations populated with actual measurements exceeds the predefined threshold; and

utilizing an estimator based on a minimum-mean-square-error criterion to estimate the position, upon determining that the percentage of locations populated with actual measurements does not exceed the predefined threshold.

17. The method of estimating a position of a mobile terminal of claim 7 wherein the step of estimating the position of the mobile terminal based on differences between the RSS measurements and the expected RSS values includes the steps of:

determining whether the percentage of locations in the database that are populated with actual measurements exceeds a first predefined threshold;

upon determining that the percentage of locations populated with actual measurements exceeds the first predefined threshold:

discarding the RSS values that are predicted values; and

utilizing an estimator based on a maximum-likelihood criterion to estimate the position;

upon determining that the percentage of locations populated with actual measurements does not exceed the first predefined threshold:

determining whether the percentage of locations populated with actual measurements exceeds a second predefined threshold that is lower than the first threshold;

utilizing the estimator based on the maximum-likelihood criterion to estimate the position, upon determining that the percentage of locations populated with actual measurements exceeds the second predefined threshold; and

utilizing an estimator based on a minimum-mean-square-error criterion to estimate the position, upon determining that the percentage of locations populated with actual measurements does not exceed the second predefined threshold.

18. The method of estimating a position of a mobile terminal of claim 1 further comprising, prior to comparing the RSS measurements obtained from the mobile terminal with the expected RSS values stored in the database, the step of selecting particular expected RSS values for particular locations in the database based on

the mobile terminal's serving sector, and wherein the step of comparing the RSS measurements includes comparing the RSS measurements obtained from the mobile terminal with the particular expected RSS values selected from the database.

19. The method of estimating a position of a mobile terminal of claim 18 wherein the step of selecting particular expected RSS values for particular locations in the database based on the mobile terminal's serving sector also includes selecting particular expected RSS values based on the RSS received at the mobile terminal from the mobile terminal's serving base station transceiver, and based on the number of base station transceivers neighboring the serving sector.

20. A method of estimating a position of a mobile terminal operating in a coverage area of a radio telecommunications network having a plurality of base station transceivers and a plurality of service sectors, said method comprising the steps of:

determining, for a plurality of positions throughout the coverage area of the network, expected Received Signal Strength (RSS) values of a signal transmitted by the base station transceivers and received by a typical mobile terminal, said determining step comprising:

predicting the expected RSS values for a first portion of the positions with a computer-aided prediction tool; and

taking actual measurements of the RSS of signals transmitted by the base station transceivers and received by a test mobile terminal for a second portion of the positions;

storing the expected RSS values at a plurality of locations in a database with an indicator for each location indicating whether each stored value is a predicted value or a measured value, said storing step including:

storing in the database, for each service sector, a first expected measurement variance for all locations in the database that are populated with measured values; and

storing in the database, for each service sector, a second expected measurement variance for all locations in the database that are populated with predicted values;

obtaining, by the mobile terminal for which the position is to be estimated, RSS measurements of signals transmitted by the base station transceivers;

weighting the RSS measurements obtained by the mobile terminal with the first expected measurement

variance for locations in the database that are populated with measured values;

weighting the RSS measurements obtained by the mobile terminal with the second expected measurement variance for locations in the database that are populated with predicted values; and

comparing the weighted RSS measurements with the expected RSS values stored in the database;

estimating the position of the mobile terminal based on differences between the weighted RSS measurements and the expected RSS values, said estimating step comprising:

determining whether the percentage of locations being considered in the database that are populated with measured values exceeds a predefined threshold;

utilizing an estimator based on a maximum-likelihood criterion to estimate the position, upon determining that the percentage of locations being considered in the database that are populated with measured values exceeds the predefined threshold; and

utilizing an estimator based on a minimum-mean-square-error criterion to estimate the position, upon determining that the percentage of locations being considered in the database that are populated with measured values does not exceed the predefined threshold.

21. A system for estimating a position of a mobile terminal operating in a coverage area of a radio telecommunications network having a plurality of base station transceivers and a plurality of service sectors, said system comprising:

means for determining expected Received Signal Strength (RSS) values of signals transmitted by the base station transceivers and received by a typical mobile terminal for a plurality of positions throughout the coverage area of the network;

means for storing the expected RSS values at a plurality of locations in a database;

means for measuring by the mobile terminal for which the position is to be estimated, the RSS of signals transmitted by the base station transceivers; and

means for comparing the RSS measurements obtained by the mobile terminal with expected RSS values, and estimating the position of the mobile terminal based on differences between the RSS measurements and the expected RSS values.

22. The system for estimating the position of a mobile terminal of claim 21 wherein the means for determining expected RSS values includes:

a computer-aided prediction tool that predicts the expected RSS values for a first portion of the positions; and

a test mobile terminal that measures the RSS of test signals received from the base station transceivers for a second portion of the positions.

23. The system for estimating a position of a mobile terminal of claim 22 wherein the means for comparing the RSS measurements obtained by the mobile terminal with expected RSS values, and estimating the position of the mobile terminal is a positioning algorithm that includes:

means for computing a metric for each location in the database; and

means for estimating the position of the mobile terminal using the computed metrics and *apriori* probabilities for each position.

24. The system for estimating a position of a mobile terminal of claim 23 wherein the means for computing a metric for each location in the database includes means for computing a different metric for each location, depending upon whether the location is populated with a predicted value or a measured value from the test mobile terminal.

25. The system for estimating a position of a mobile terminal of claim 24 wherein the means for estimating the position of the mobile terminal using the computed metrics and the apriori probabilities for each location includes:

an estimator based on a maximum-likelihood criterion;

an estimator based on a minimum-mean-square-error criterion; and

means for selecting the estimator based on the maximum-likelihood criterion if the percentage of locations in the database that are populated with actual measurements exceeds a predefined threshold, or for selecting the estimator based on the minimum-mean-square-error criterion if the percentage of locations in the database that are populated with actual measurements does not exceed the predefined threshold.

26. A method of populating a database with expected Received Signal Strength (RSS) values for a typical mobile terminal operating in a coverage area of a radio telecommunications network having a plurality of base station transceivers that transmit radio signals received by the mobile terminal, said method comprising the steps of:

determining, for a plurality of positions throughout the coverage area of the network, expected RSS values of a signal transmitted by the base station transceivers and received by the typical mobile terminal, said determining step comprising the steps of:

predicting the expected RSS values for a first portion of the positions with a computer-aided prediction tool; and

taking actual measurements of the RSS of signals transmitted by the base station transceivers and received by a test mobile terminal for a second portion of the positions; and

storing the predicted and measured expected RSS values at a plurality of locations in the database.

27. The method of populating a database of claim 26 further comprising tagging each location in the database to indicate whether the stored RSS value is a predicted value or a measured value.